

# Preventing Dengue Fever in Hawaii

# Dengue Virus

- Causes dengue and dengue hemorrhagic fever
- Transmitted by mosquitoes
- **Not transmitted by people or pets**
- Has 4 serotypes (DEN-1, 2, 3, 4)
- Each serotype provides specific lifetime immunity

# Clinical Characteristics of Dengue Fever

- Fever
- Headache
- Muscle and joint pain
- Nausea/vomiting
- Rash
- Hemorrhagic manifestations
- *May have some or none of these*

# Dengue Hemorrhagic Fever

- Fever
- Hemorrhagic manifestations
- Low platelet count
- Vascular permeability (leaking capillaries)
- 1% -- 5% mortality
- Rare in first infections

# *Aedes* Mosquitoes

- Dengue transmitted by infected female mosquito
- Primarily a daytime feeder
- *Aedes aegypti* is the usual vector
- *Aedes albopictus* is the vector in Hawaii

# *Aedes albopictus* Mosquito

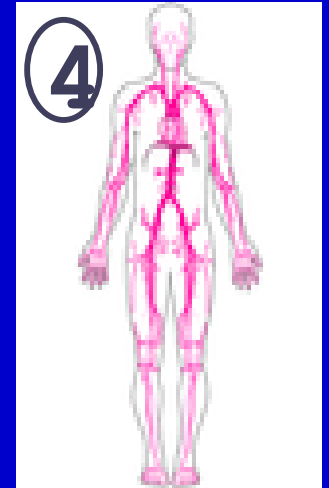
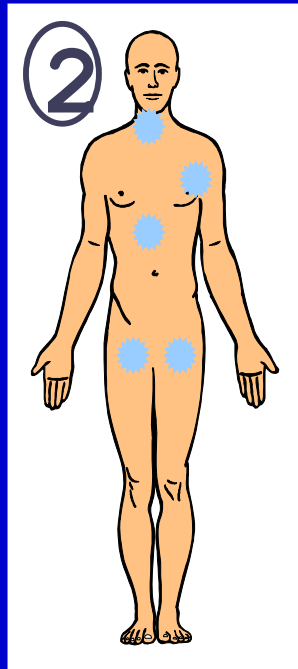
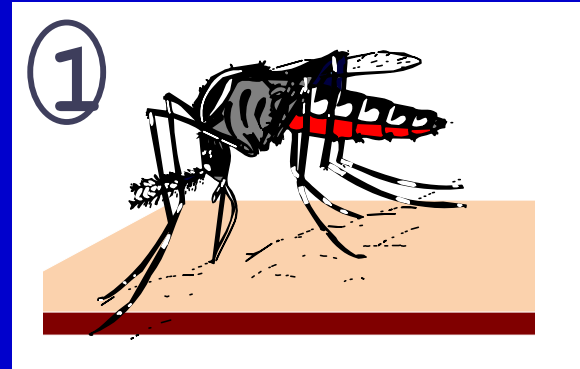


# *Aedes albopictus* Mosquito



# Replication and Transmission of Dengue Virus (Part 1)

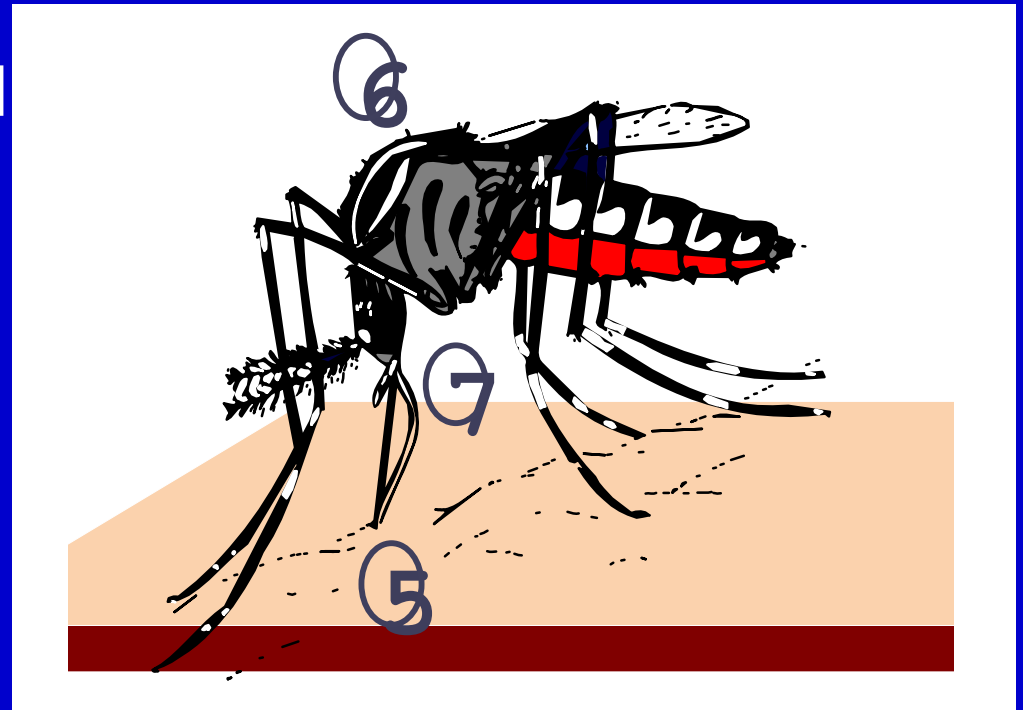
1. Virus transmitted to human in mosquito saliva
2. Virus replicates in target organs
3. Virus infects white blood cells and lymphatic tissues
4. Virus released and circulates in blood





# Replication and Transmission of Dengue Virus (Part 2)

- 5. Second mosquito ingests virus with blood
- 6. Virus replicates in mosquito and, infects salivary glands
- 7. Virus replicates in salivary glands



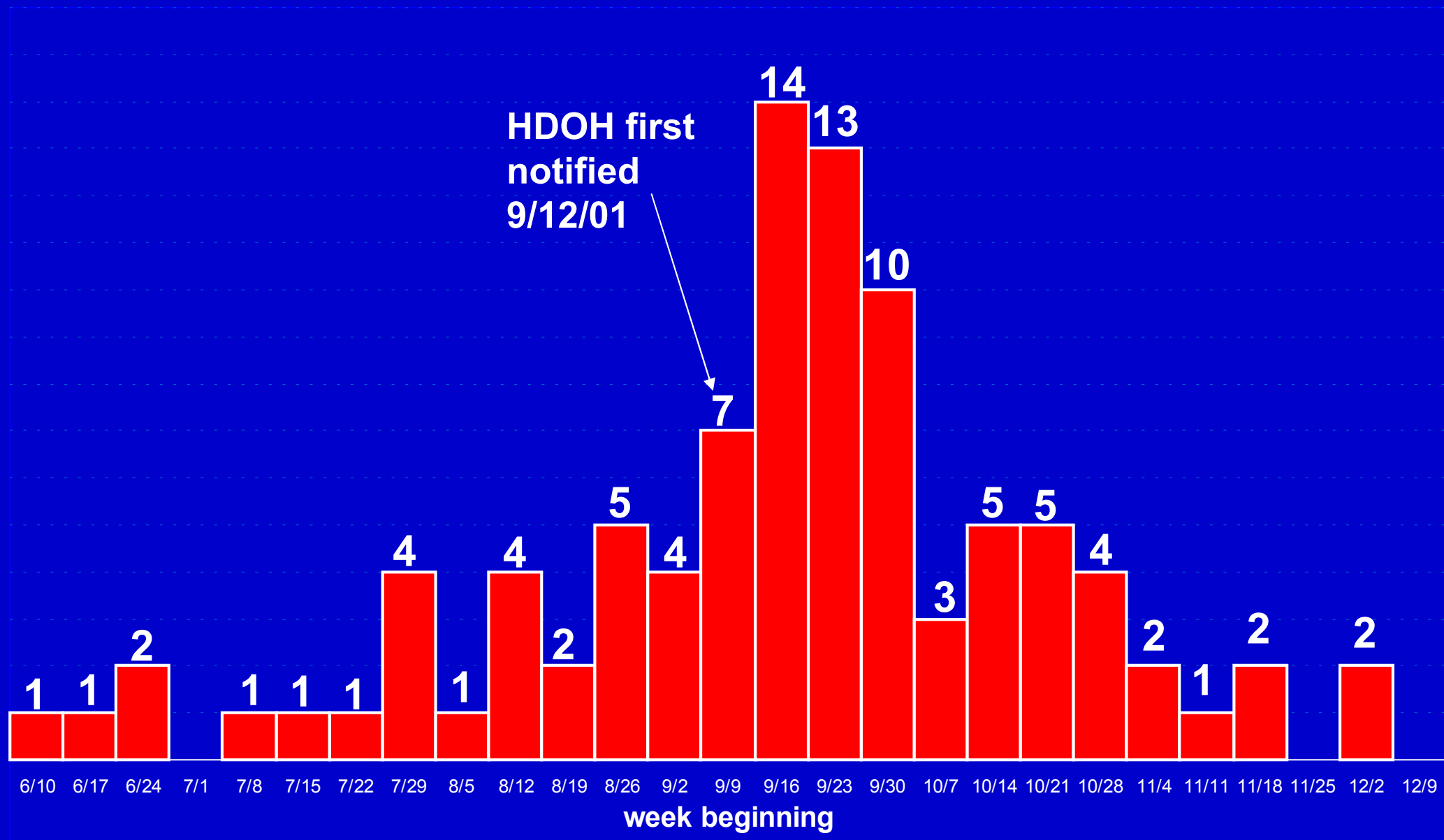
# Critical Time Periods

Incubation in man	4–7 days (3–14)
Viremia in man	~5 days
Symptoms in man	5 days (3–10)
<i>IgM Ab elevation</i>	<i>6–21 days post onset</i>
Incubation in mosquito	8–12 days
Viremia in mosquito	1–2 months (lifetime)
<b><i>Viremia begins slightly before onset of symptoms.</i></b>	

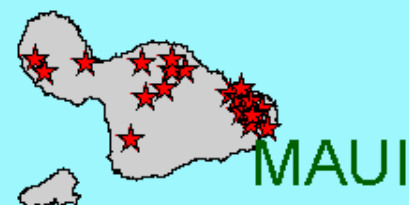
# The Outbreak in Hawaii

# Confirmed Dengue Cases by Week of Onset

updated 12/18/01

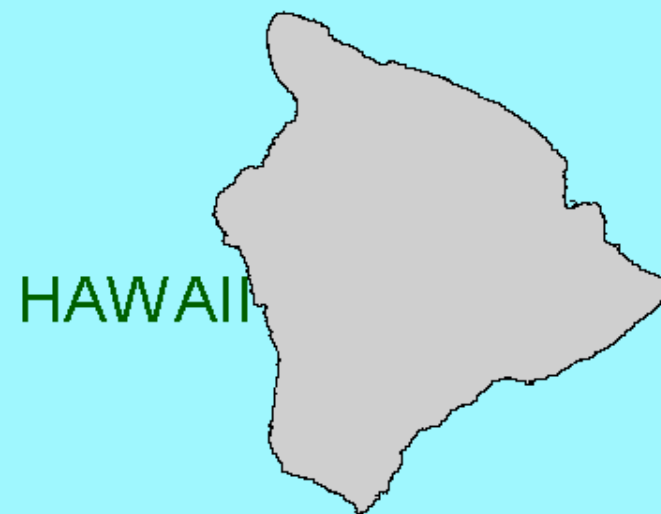


★ confirmed dengue cases  
(n = 95)



# STATE OF HAWAII

updated 12/18/01



Source: HDOH/Epidemiology Branch

# MAUI

★ confirmed dengue cases  
(n = 70)

Lahaina

Wailuku

Paia

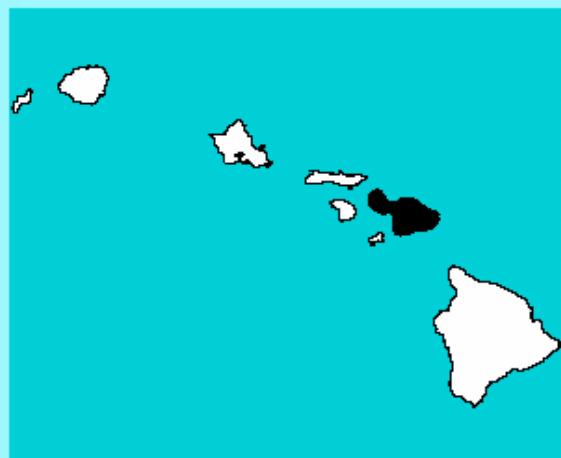
Haiku

Pukalani

Makawao

Hana

Kihei



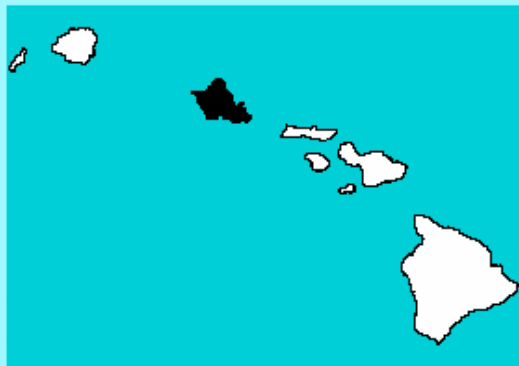
updated 12/18/01

0

20 Miles

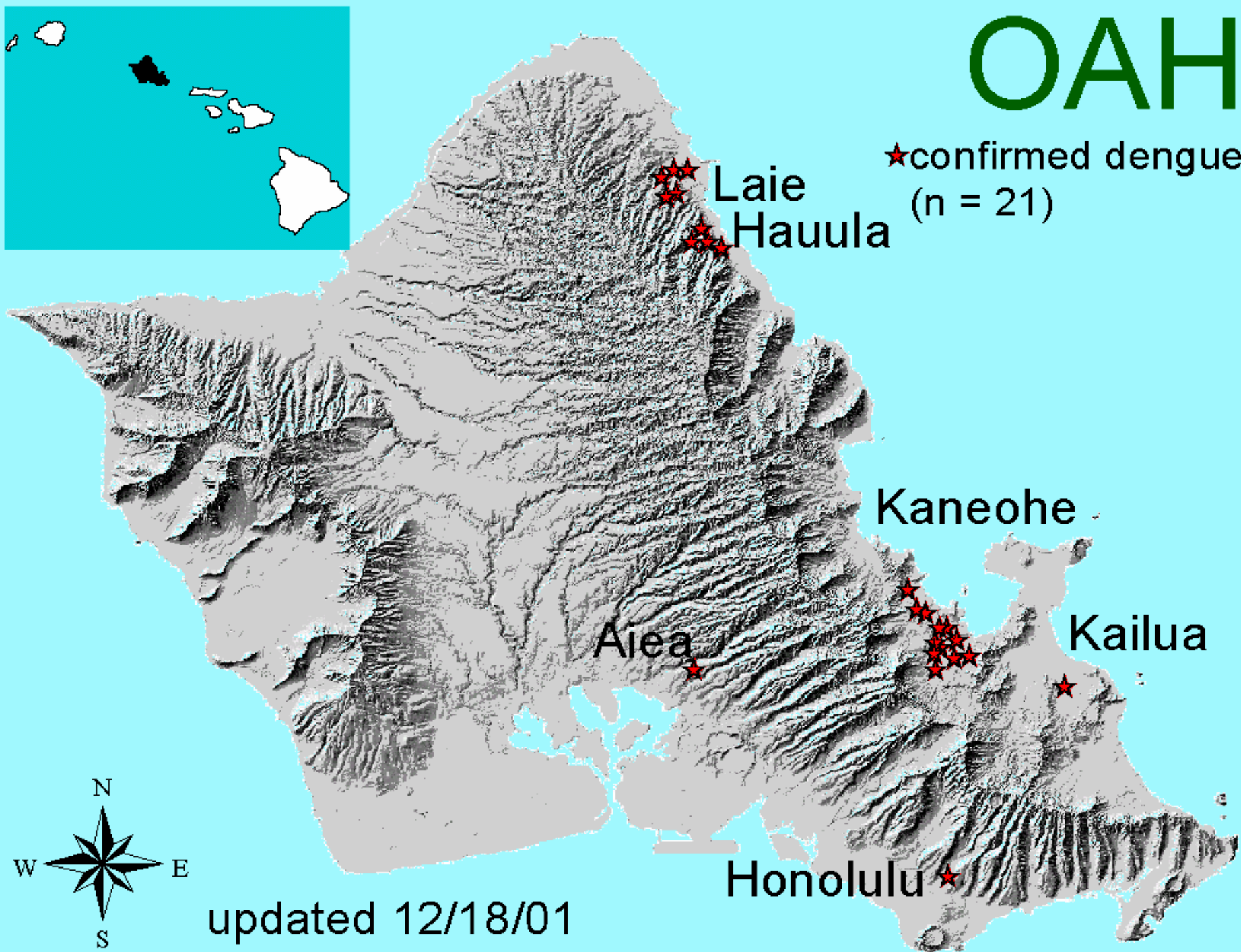
Source: HDOH/Epidemiology Branch





# OAHU

★ confirmed dengue cases  
(n = 21)



updated 12/18/01

0

20 Miles

Source: HDOH/Epidemiology Branch

# KAUAI

★ confirmed dengue cases  
(n = 4)

Hanalei

Anahola

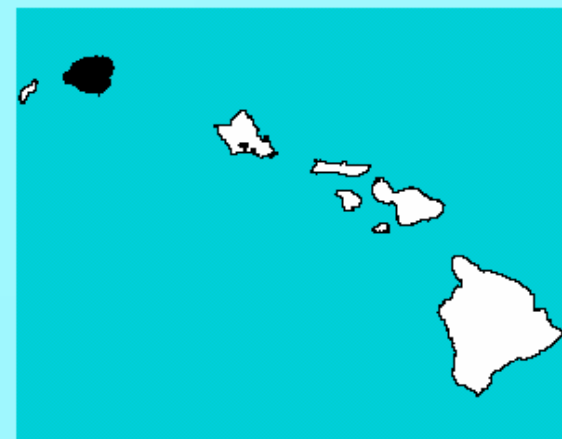
Kapaa

Kalaheo

updated 12/18/01



0 10 20 Miles

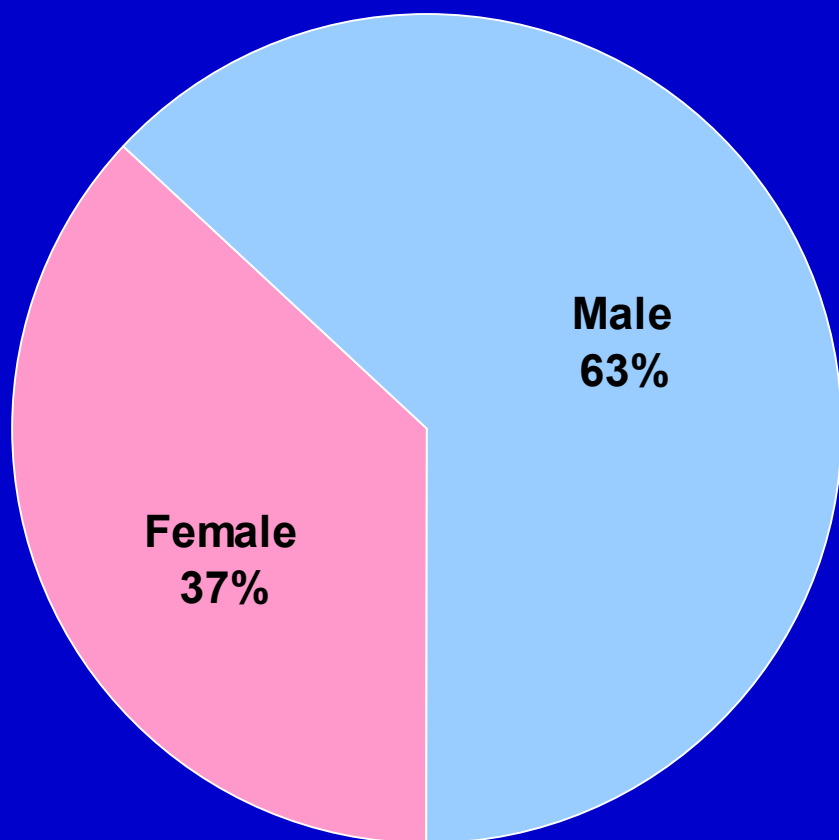


Source: HDOH/Epidemiology Branch

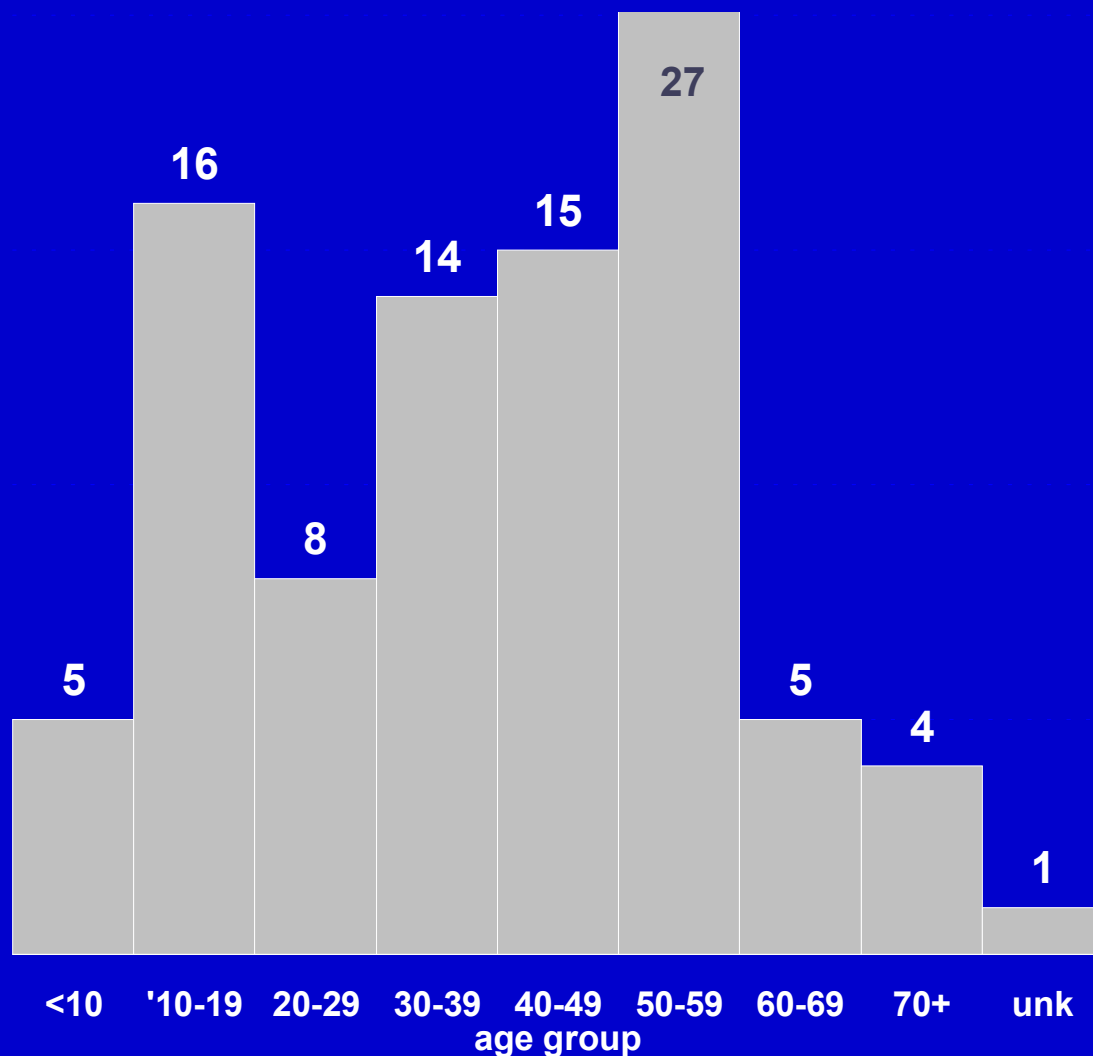


# CDC Confirmed Dengue Cases

by gender



by age group



12/18/01

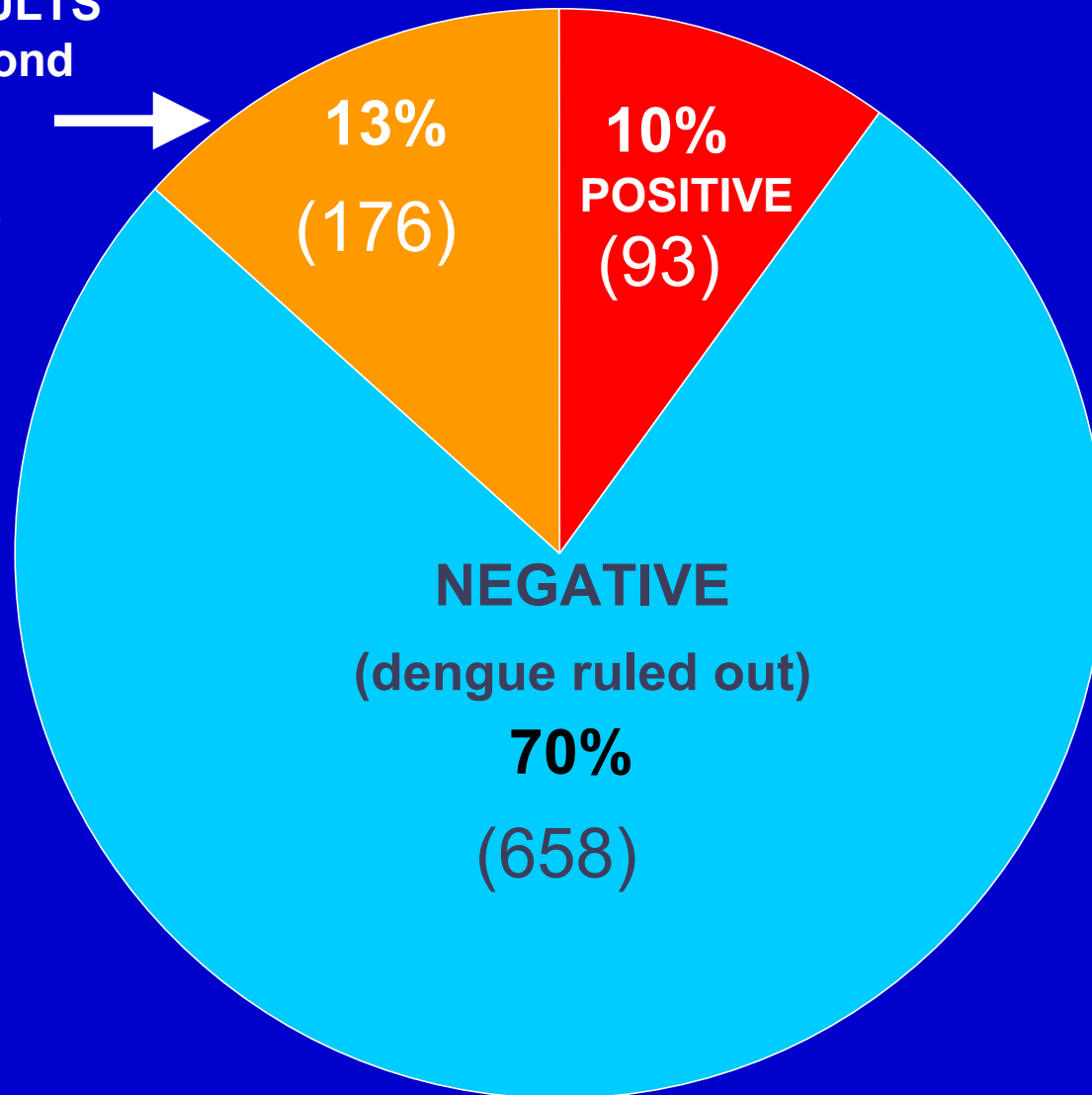
Source: HDOH/Epidemiology Branch

# Dengue Test Results Received

954 Suspect Cases

**NEED RESULTS**

From a second  
blood draw  
(test results  
inconclusive)



12/18/01

# What DOH is Doing

- Active Surveillance
- Fogging/larvaciding 200 yard vicinity of all suspected cases
- Testing/Following up all suspected cases
- Public Education
- Coordination with counties
- Soliciting community support

# Prevention and Control

# Personal Prevention

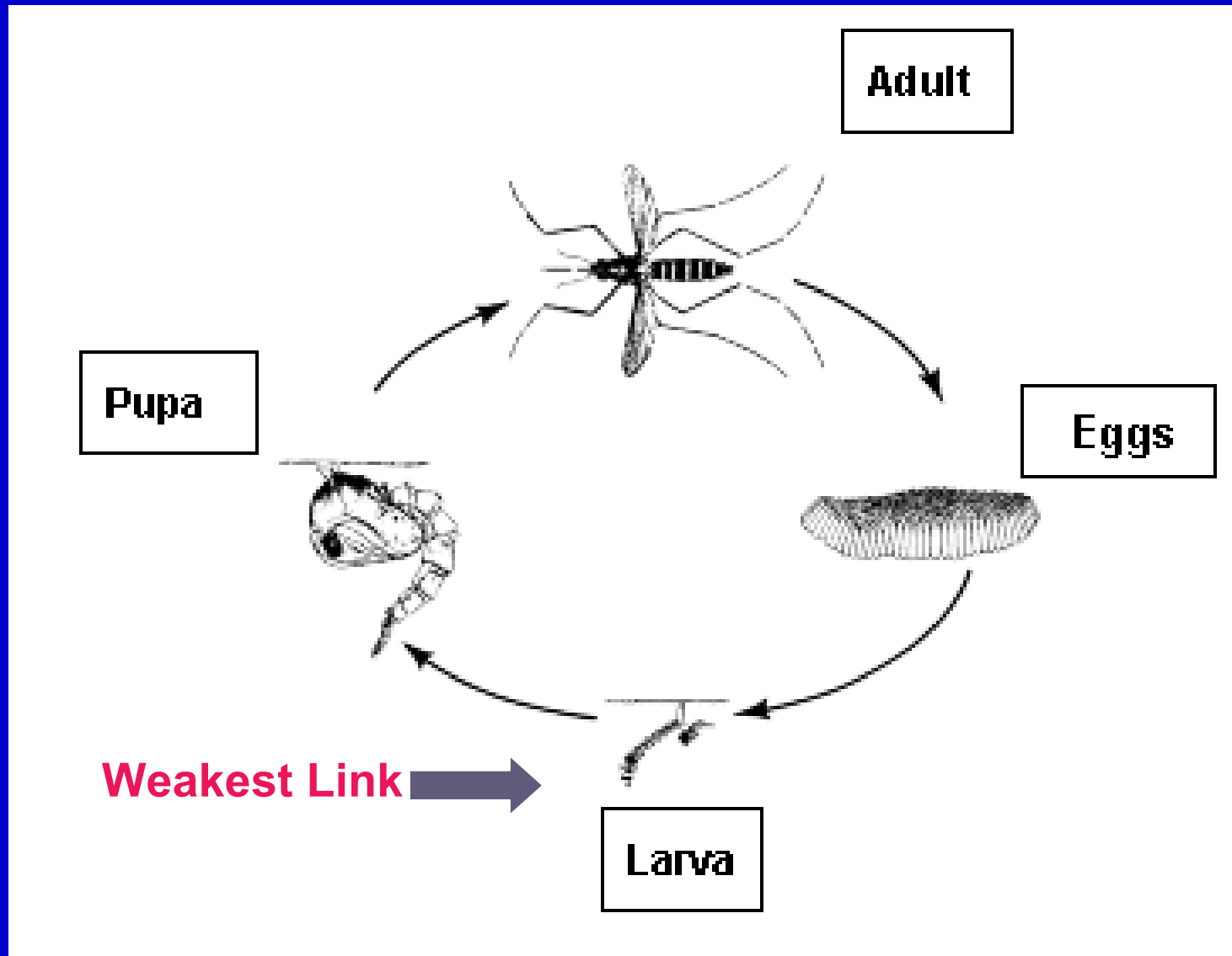
- Protect yourself by:
  - Use effective repellants (“DEET”)\*
  - Wear long pants and light colored long sleeve shirts.
- Early morning, late afternoon before sunset, and shady places are *aedes* favorites

*\*N,N-diethyl-meta-toluamide*

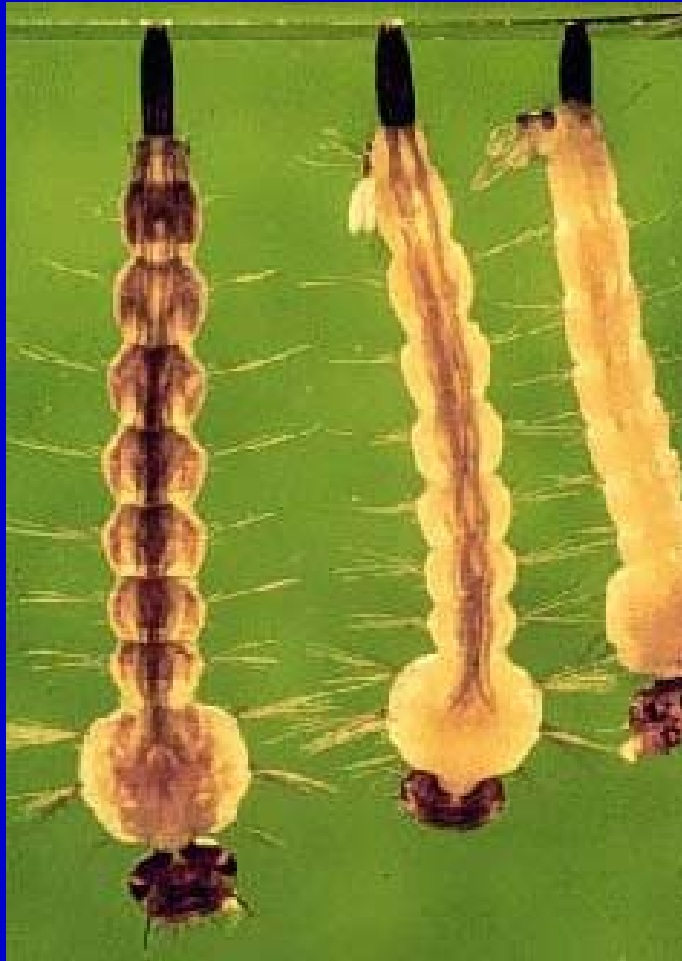
# Mosquito Control

- Insecticide spraying for limited areas, short-term control
- Mosquito populations can be reduced by eliminating breeding places
- Effective control is a long-term process
- Without control, additional Dengue outbreaks can be expected

# Mosquito Life Cycle



# Mosquito Larvae (wrigglers)





# *Aedes albopictus* Breeding

- Female lays eggs every 5-7 days after blood meal
- Female lays eggs in container just above water line
- Eggs can survive many months before hatching
- Eggs hatch when water level rises

# Breeding Sites

- Tires
- Buckets
- Vases/Flower pots
- Plants
- Pots, dishes
- Boats
- Bird-baths
- Tree holes/bamboo
- Discarded buckets
- Outdoor tarps
- Cans, bottles, cups
- Pet dishes
- Open fence posts
- Hollow tile walls
- Wheelbarrows
- Clogged gutters



1. Old tyres  
2. Laundry tanks  
3. Uncovered tanks  
4. Drums/Barrels  
5. Discarded buckets and other containers  
6. Pet dishes  
7. Construction blocks  
8. Bottles  
9. Discarded tin cans  
10. Tree holes & bamboos  
11. Bottle pieces on top of walls  
12. Old shoes  
13. Flower pots & saucers  
14. Discarded toys  
15. Roof guttering  
16. Bromeliad plants  
17. Garden containers & tools  
18. Brick Holes

Produced by the  
Caribbean Epidemiology Centre (CAREC)  
in collaboration with PAHO/WHO  
with the support of the Italian Government

**Without containers there is no mosquito; without mosquitoes there is no Dengue.  
Get rid of breeding places in your surroundings.**

# Environmental Control

- Discard items that collect rainwater.
- Empty and clean pet watering containers, vases, etc. once a week.
- *Mosquito Proof* catchment tank.
- Repair windows and doors.
- Use *Larvacides to control breeding areas (4-6 oz. Liquid Dish Detergent in a gallon of water)*
- Conduct routine inspections
- *Bacillus thuringiensis israelensis*



# Requirements for Mosquito Control in Hawaii

Individual Responsibility

Community Action

Government Support

***Let's Make Every Sunday  
Dengue Clean-up Day***

# For More Information

- Help Line: 586-8352
- Web site: [www.hawaii.gov/doh/dengue](http://www.hawaii.gov/doh/dengue)